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WDFW HABITAT GUIDELINES

Planning, design and ecological considerations in process based natural channel design for habitat restoration, including channel configuration, riparian function, sediment transport, hyporheic function and flood plain connectivity. Channel design parameters are addressed, including specific habitats (spawning, rearing, holding, riparian, etc.), habitat forming structures, and off-channel habitats. Page estimates are averages for budgeting purposes and may vary for specific sections but not overall.

1 HEADING PLACEHOLDER – DO NOT DELETE

2 HEADING PLACEHOLDER – DO NOT DELETE

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4 SELECTING A RESTORATION APPROACH

4.1 Heading Placeholder – Do Not Delete

4.2 Heading Placeholder – Do Not Delete

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4.5 Design Criteria

(2-3 pages for following sections in total)

Through the development of design criteria for stream habitat restoration projects, an interdisciplinary team can:

- Clarify stakeholder objectives;
- Proceed with design that has a high probability of meeting shared expectations;
- Define the risk associated with design components;
- Establish a monitoring plan that is directly related to design objectives; and
- Evaluate the success of a project. (For further discussion of evaluation criteria to measure success, refer to: Kondolf and Micheli, 1995)

4.5.1 What are Design Criteria?

Design criteria are specific, *measurable* attributes of project components developed to meet objectives

(Miller and Skidmore, in press) and are typically developed by the project implementation team as a means of clarifying project objectives. Design criteria are acceptable benchmarks for individual components of a design, providing numeric allowable limits of performance and tolerance. Criteria for habitat restoration and design define the spatial and temporal aspects of project objectives. They also address any constraints to fully achieving project objectives that may be imposed by social, political or jurisdictional boundaries.

Ideally, design criteria are developed with stakeholder review and feedback, such that they clearly represent the intent of the project and identify the risk associated with various design components. Perhaps equally important, design criteria provide a framework by which to measure project success. Design criteria can provide the ideal framework for establishment of a monitoring protocol.

4.5.2 Examples of Design Criteria

Design criteria for stream habitat restoration and design can be categorized relative to the process they are intended to define or the objective they are intended to meet. For example, the following process-related attributes can be defined using design criteria:

- Channel form: Design criteria define whether the channel location is allowed to deform over time, the degree to which it is allowed to migrate within a defined corridor, and what channel pattern (braided, meandering, or straight) will be applied.

- Floodplain function: Design criteria define the frequency and duration of floodplain inundation as it relates to stream stability, riparian vegetation health, and fish and wildlife habitat development and connectivity.

- Aquatic habitat: Design criteria define what species or life stages are targeted, or what degree of diversity of habitat and species is to be achieved.

- Timeframe: Design criteria define the timeframe under which objectives are to be met, and may specify both durability and longevity.

Design criteria for many project components in channel design can be related to hydrologic events, such as the design flood, bankfull flow, or low flow conditions. Projects requiring full channel restoration or reconstruction may require a suite of design flows to adequately clarify objectives using design criteria. A low-flow discharge may be defined by which habitat elements (such as pool depth) are designed; a discharge may be defined for channel components that relate to geomorphic function (such as cross-section and planform); and a flood level discharge may be defined for design components which must comply with floodplain regulations.

There are two classes of design criteria – performance criteria and prescriptive criteria. Performance criteria define what a project will achieve, while prescriptive criteria define how a project is to be

achieved. The difference between the two types can be illustrated by considering the objective of increasing large woody debris jams in a channel system. Performance criteria may include a target volume of large woody debris in jams per length of channel after a given period of time, without dictating how this is achieved. Prescriptive criteria, on the other hand, may dictate the method and location of placement of large woody debris jams. While performance criteria may be better suited to ensuring that project objectives are achieved, they must be carefully articulated such that they are reasonable, achievable, and measurable.

4.5.3 How Design Criteria Relate to Monitoring

As described above, design criteria can be developed as either performance criteria or prescriptive criteria. Those developed as performance criteria can facilitate the development of a monitoring plan that is directly related to project objectives. The monitoring plan is established to measure performance relative to the criteria established. Placeholder – example to be added at 90%. Monitoring plan and protocol development are further discussed in Appendix X – Monitoring.

Prescriptive criteria can also be used as the basis of a monitoring plan, though such monitoring will be better suited to evaluating durability and longevity of design components rather than success relative to project objectives. In such a case, post-implementation monitoring plans are based on measuring project attributes, rather than project performance. Placeholder – example to be added at 90%.Nonetheless, by comparing post-project measurements to pre-project design criteria, the success of the project components can be evaluated.

Consider again the example of project objectives including improved aquatic habitat through increased numbers of large woody debris jams. With prescriptive criteria, dictating the form and number of debris jams, a project may be deemed unsuccessful if the jams became dislodged before the end of the intended project life. Yet the jams may reform in another location, with the same wood, in the same reach and continue to provide desired function. Properly formulated performance criteria that include definition of project life can resolve this discrepancy between project intent and project criteria in monitoring.

4.5.4 References

Kondolf, G.M. and E. R. Micheli. 1995 Evaluating stream restoration projects. Environmental Management, Vol. 19, No. 1, pp 1-15.

Miller, D.E. and P. B. Skidmore. In press, 2002. A Foundation for Establishing a Standard of Practice for Natural Channel Design: In: Montgomery, D.R., S.M. Bolton and D.B. Booth (eds.). Restoration of Puget Sound Rivers. UW Press, Seattle, WA.